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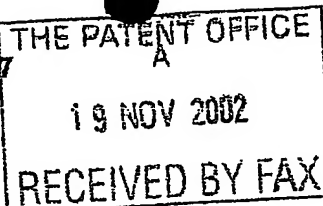
*H. Behan*

Dated

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Patents Act 1977  
(Rule 13)The  
Patent  
Office19/11/02 F744447-1 D03012  
P01/7700 0.00-0226896.9**Request for grant of a patent***(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)*

The Patent Office

Cardiff Road  
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NP9 1RH

1. Your reference

P3125

2. Patent application number

*(The Patent Office will fill in this part)*

0226896.9

19 NOV 2002

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*Huntleigh Technology PLC  
310-312 Dallow Road  
Luton  
Bedfordshire  
LU1 1TDPatents ADP number *(if you know it)*

506907001

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

4. Title of the invention

Electrical Coupling

5. Name of your agent *(if you have one)*Shalini Thaker  
Group IPR Department  
Huntleigh Technology PLC  
310-312 Dallow Road  
Luton  
Bedfordshire  
LU1 1TD"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*Patents ADP number *(if you know it)*

7111263003

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country

Priority application number  
*(if you know it)*Date of filing  
*(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
*(day / month / year)*8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

Yes

a) any applicant named in part 3 is not an inventor, or  
b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body.

See note (d))

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Continuation sheets of this form -

Description 4

Claim(s) 2

Abstract *one*Drawing(s) 1 *only*

10. If you are also filing any of the following, state how many against each item.

Priority documents -

Translations of priority documents -

Statement of inventorship and right to grant of a patent (Patents Form 7/77) -

Request for preliminary examination and search (Patents Form 9/77) -

Request for substantive examination (Patents Form 10/77) -

Any other documents -  
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date 19 November 2002

12. Name and daytime telephone number of person to contact in the United Kingdom.

Tracey Long (01582) 745812

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**Patents Form 1/77**

Electrical Coupling

DUPLICATE

The present invention relates to a coupling arrangement for transferring electrical energy, in particular an inductive coupling arrangement for connecting a transducer to a measuring device. The invention replaces a conventional electrical connector with an inductive coupler where the electrical signal is alternating.

Conventional electrical connectors rely on conductors being brought into contact with one another and the quality of the contacts can reduce because of wear and corrosion of the contact surfaces resulting in noise affecting the transmission signals. Additionally they can result in electrical connections being exposed to the user and, in the case of medical equipment, the patient which could result in harmful circulating currents.

The present invention relates to a coupling mechanism for transferring electrical alternating signals between a transducer and a measuring circuit without the need for conductive contacts. In medical devices this has many advantages in that a low cost connector can be devised that can withstand the rigours of sterilisation, will not electrically wear and will have negligible leakage currents.

The transducer is normally connected to the electronics by cable connectors, and prior art transducers are usually connected to the electronics by means of a cable having electrical connections. However, electrical connectors for use with such transducers have to withstand numerous sterilisation cycles with approved sterilants and high level disinfectants. These connectors must also be immune to enzyme or detergent solutions and in many cases must be supplied with a protective cover or boot to prevent the ingress of sterilising or

disinfectant solutions. Because of the sterilisation process, it is difficult to prevent corrosion or oxidation of the contact surfaces of the connectors even when covered.

5 In addition they must be capable of withstanding high temperatures and high pressures simultaneously, when autoclaved.

The object of the present invention is to provide a simple sealed signal connection between the cable  
10 connected with the transducer and the electronics without the disadvantages of having exposed contact surfaces.

Accordingly, the present invention provides a magnetic coupling for transferring electrical energy to or from a transducer and measuring circuit, said coupling  
15 comprising a first coil of an inductive coupling arrangement connected to said transducer and a second coil of the inductive coupling arrangement connected to the measuring circuit. Preferably, the first and second coils are enclosed in separate housings, the first  
20 housing detachably attached within the second housing. Therefore, the electrical energy is transferred without electrical connectors having exposed contact surfaces.

In a preferred embodiment, the magnetic coupling is at the end of a cable connector with at least one  
25 transducer, the connector including a first housing enclosing the end of the cable, a first coil of an induction coupling arrangement electrically connected to the end of the cable within the housing, the housing detachably connected to a second coil of the inductive  
30 coupling arrangement to make the signal coupling.

Preferably, the first housing is hermetically sealed to allow for sterilisation. Preferably, the second inductive coil is enclosed in a second housing dimensioned to allow free travel of the first housing to  
35 make the signal coupling.

More preferably, the first and second housings are held together by suitable frictional or latching means.

An embodiment of the present invention is described below, by way of example only, with reference to the  
5 accompanying drawings in which:

Figure 1 shows a partial sectional view of the male part of the connector;

Figure 2 shows a partial sectional view of the female part of the connector; and

10 Figure 3 shows the two parts in Figures 1 and 2 joined together.

In inductive connectors, there is no direct transfer of energy from one connector to the other, i.e. by means of an electrical connection. Energy is transferred  
15 magnetically between connectors in the same manner as in a transformer.

The inductive coupling consists of a male connector part including a coil wound on a magnetic core and a female connector part containing a second coil wound so  
20 as to enclose the male connector part.

With reference to Figure 1, a single layer solenoid 7 is wound on a ferromagnetic rod 6 which may be composed of Manganese-Zinc or Nickel-Zinc ferrite material chosen for the desired operating frequency range. The ends of  
25 the solenoid winding 5a and 5b are connected to conductors 3a and 3b via solder connections 4a and 4b. Conductors 3a and 3b are connected to an ultrasound probe (not shown) via cable 1. Cable 1 may be of coaxial or twisted pair construction. Solenoid 7, ferromagnetic core  
30 6 and cable terminations 4a, 4b are surrounded by plastic housing 2. A hermetic seal is provided by filling internal void 8 with a synthetic resin (not shown). In addition the synthetic resin provides strain relief for cable 1.

35 With reference to Figure 2, a plastic housing 10 contains a single layer solenoid 11. Solenoid 11 is

dimensioned so as to allow the free travel of the male connector part when the connectors are mated. The ends of solenoid 11 are brought out to terminals 12a and 12b to facilitate electrical connection to the ultrasound drive electronics (not shown). The solenoid 11 may be glued or bonded into the housing 10 by means of synthetic resin or similar or the housing 10 may be injection moulded around the coil 11.

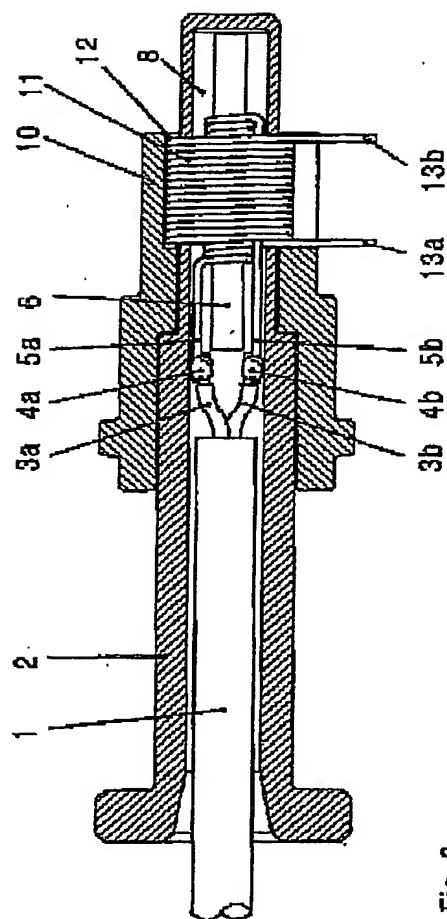
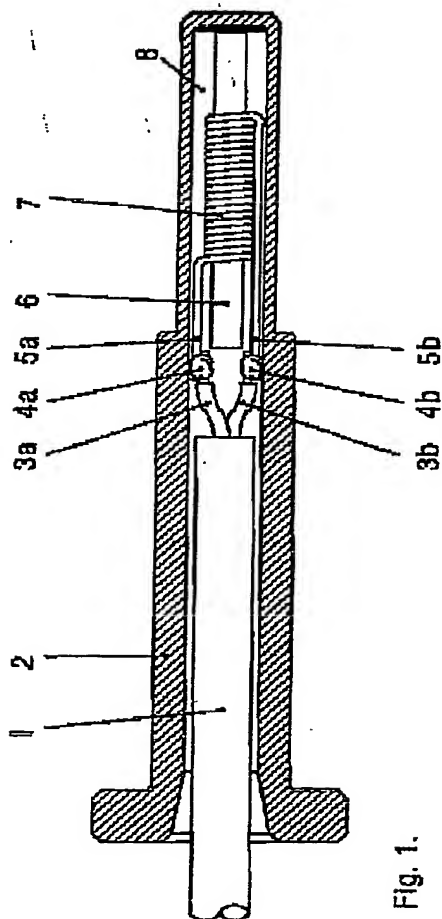
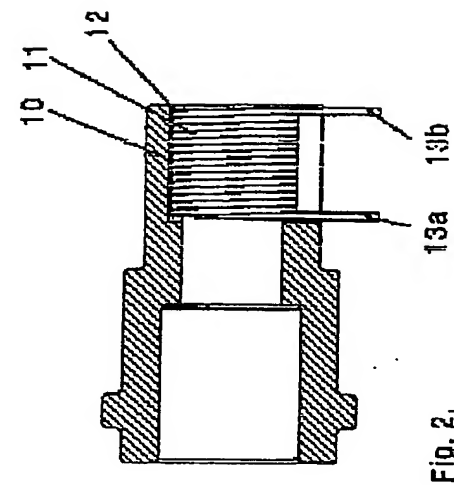
Figure 3 shows the two connector parts when they are joined together. The connectors may be held together by means of friction or a suitable latching mechanism (not shown).

Although the invention has been described with a specific configuration of the male and female parts, it will be understood that the size of the two parts and their respective coils may be adjusted to optimise the transformer magnetising and leakage inductance for different operating frequencies or different source or load impedances. Furthermore, although the specific example above relates to an ultrasound probe, the invention is equally applicable to similar electrical connections for transducers and their electronics where exposed electrical connections are undesirable. Similarly, although the example relates to a single transducer and its connection, the invention covers multiple transducers and their mutual or individual electrical connections to their electronics.

CLAIMS:

1. A magnetic coupling for transferring electrical energy to or from a transducer and measuring circuit,  
5 said coupling comprising a first coil of an inductive coupling arrangement connected to said transducer and a second coil of the inductive coupling arrangement connected to the measuring circuit.
- 10 2. A magnetic coupling as claimed in claim 1 wherein the first and second coils are enclosed in separate housings, the first housing detachably attached within the second housing.
- 15 3. A magnetic coupling as claimed in claims 1 or 2 wherein the coupling is at the end of a cable connector connected to at least one transducer, the connector including a first housing enclosing the end of the cable,  
20 a first coil of an induction coupling arrangement electrically connected to the end of the cable within the housing, the housing detachably connected to a second coil of the inductive coupling arrangement to make the signal coupling.
- 25 4. A magnetic coupling as claimed in claims 2 or 3 wherein the first housing is hermetically sealed.
5. A magnetic coupling as claimed in claims 2, 3 or 4 wherein, the second inductive coil is enclosed in a  
30 second housing dimensioned to allow free travel of the first housing to make the signal coupling.
6. A magnetic coupling as claimed in claim 5 wherein first and second housings are held together by suitable  
35 frictional or latching means.

7. A magnetic coupling substantially as hereinbefore described and with reference to the accompanying drawings.



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